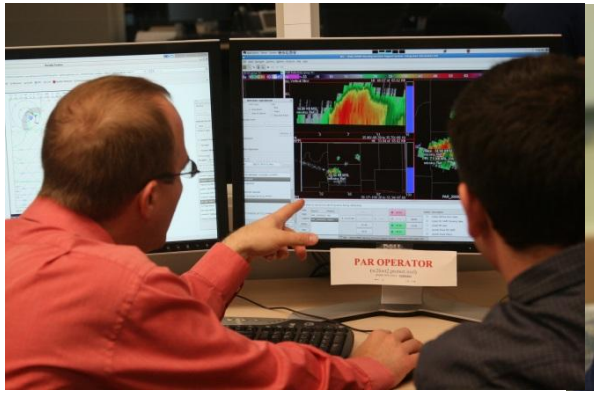
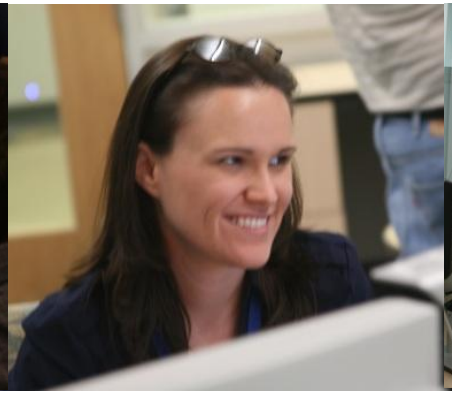
Exploring the Impact of Rapid-scan Radar Data on NWS Warnings






Pam Heinselman
NOAA National Severe Storms Laboratory

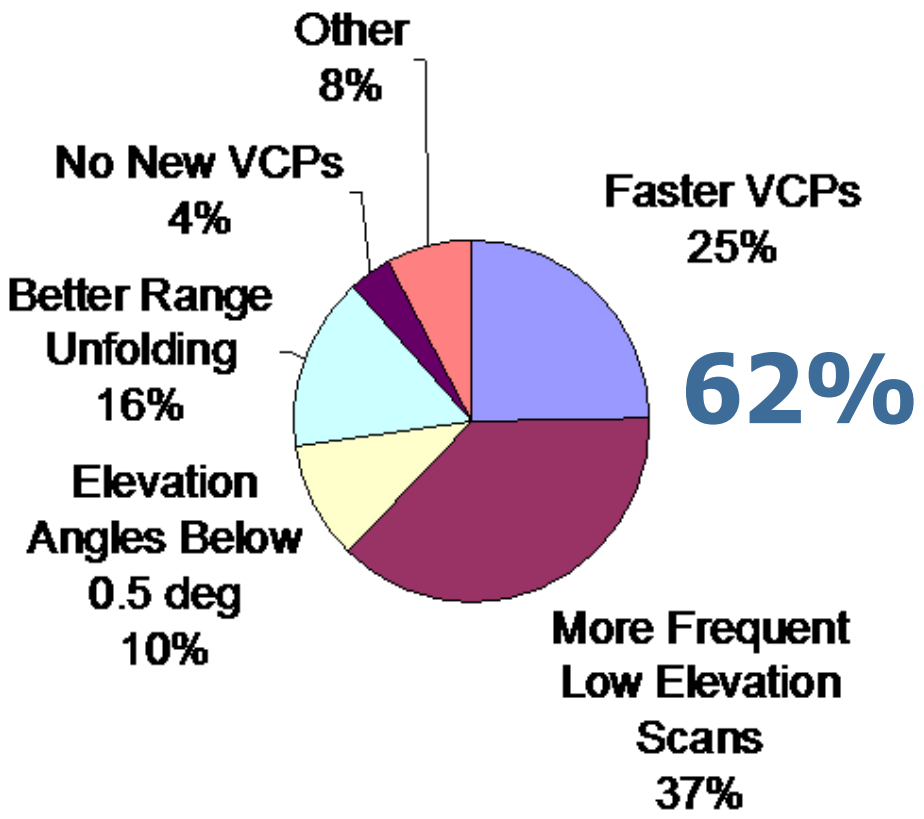
Daphne LaDue
OU CAPS

Heather Lazrus
NCAR

Warn on Forecast Workshop 8 Feb 2012

Motivation

Stakeholders' needs:
Faster Updates

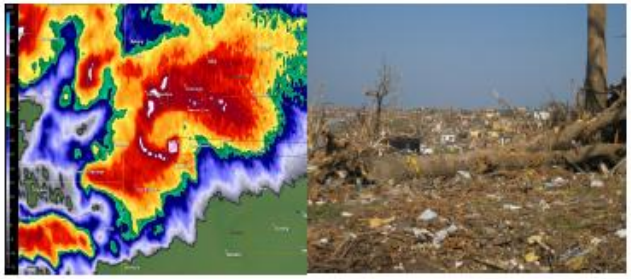


Source: Radar Operations Center

Motivation

NWS Central Region Service Assessment

Joplin, Missouri, Tornado – May 22, 2011

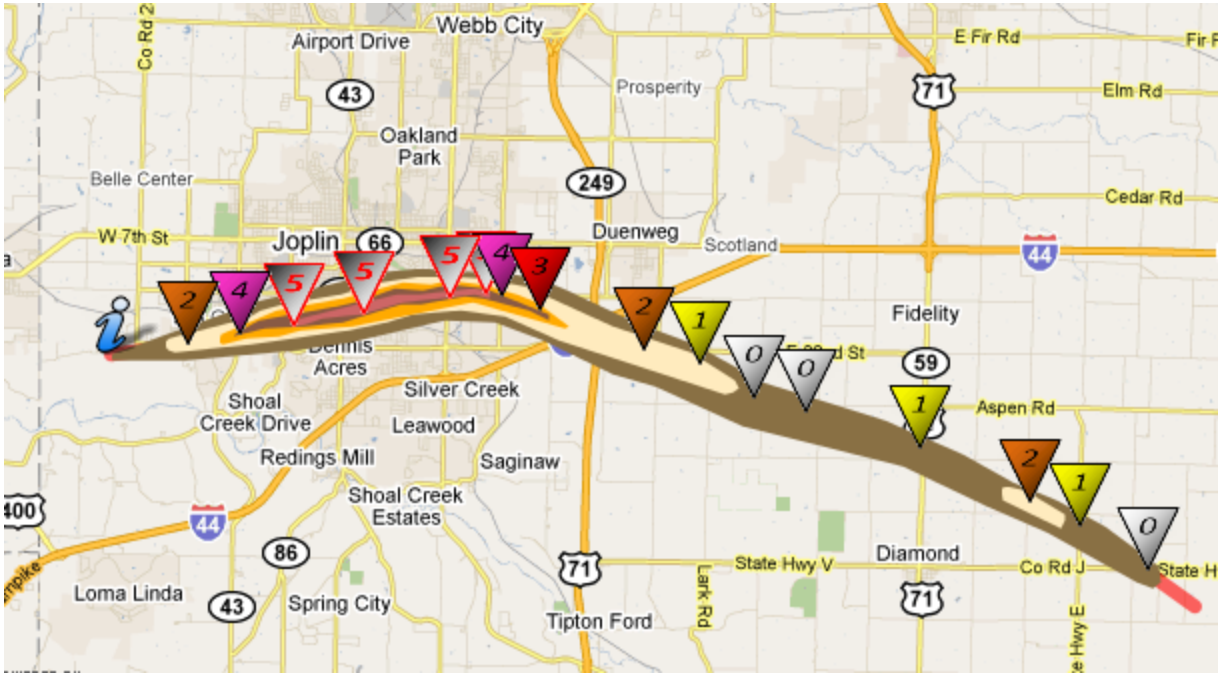


U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service, Central Region Headquarters
Kansas City, MO

July 2011

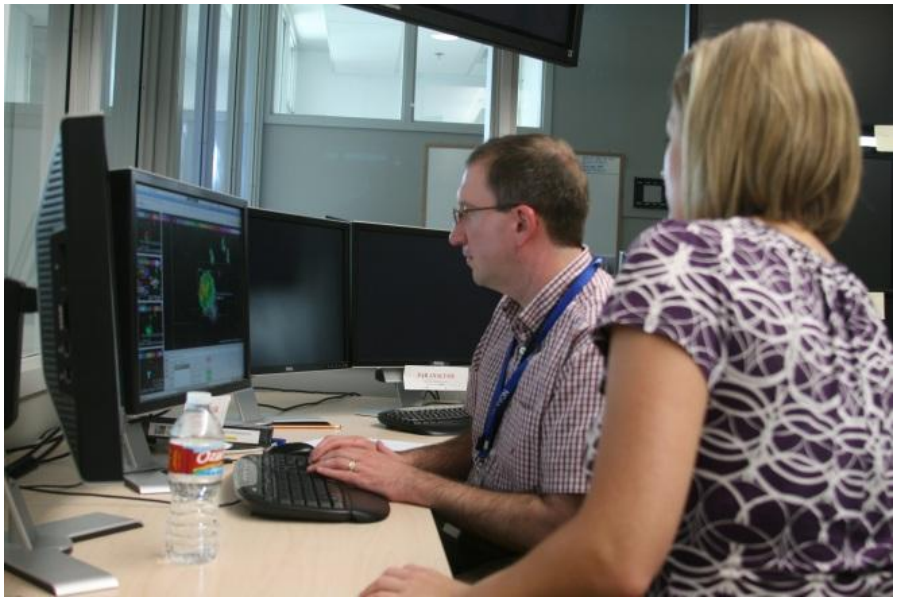
Motivation

"To enhance the ability to monitor rapid tornadogenesis, the **NWS should develop and implement additional Volume Coverage Pattern strategies that allow for more continuous sampling near the surface** (e.g., 1-min lowest elevation sampling)."



Objective

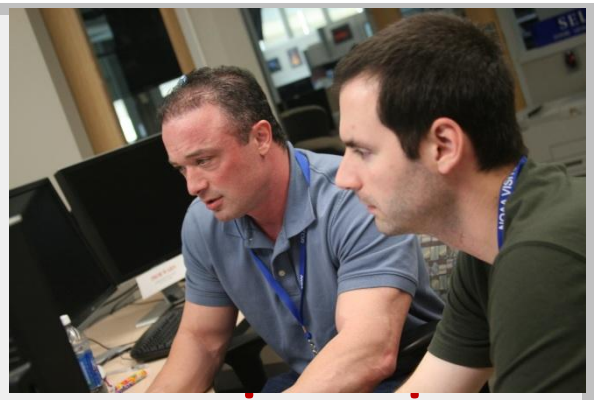
Explore how improvements in depiction of storm development from rapid sampling may benefit forecasters' decision making process.



PHASED-ARRAY RADAR

Innovative Sensing Experiment

12 forecasters, 12-30 April 2010



Tuesday Afternoon

Introduction to PAR & WDSS-II training

Tuesday Evening and Wednesday

Gain experience interrogating PAR data and issue warnings using WDSS-II WARNGEN

Thursday

Temporal Resolution Experiment

Temporal Resolution Experiment

Paired forecasters w/ similar radar analysis skills

Worked tropical supercell event that produced EF1 tornado (unwarned)

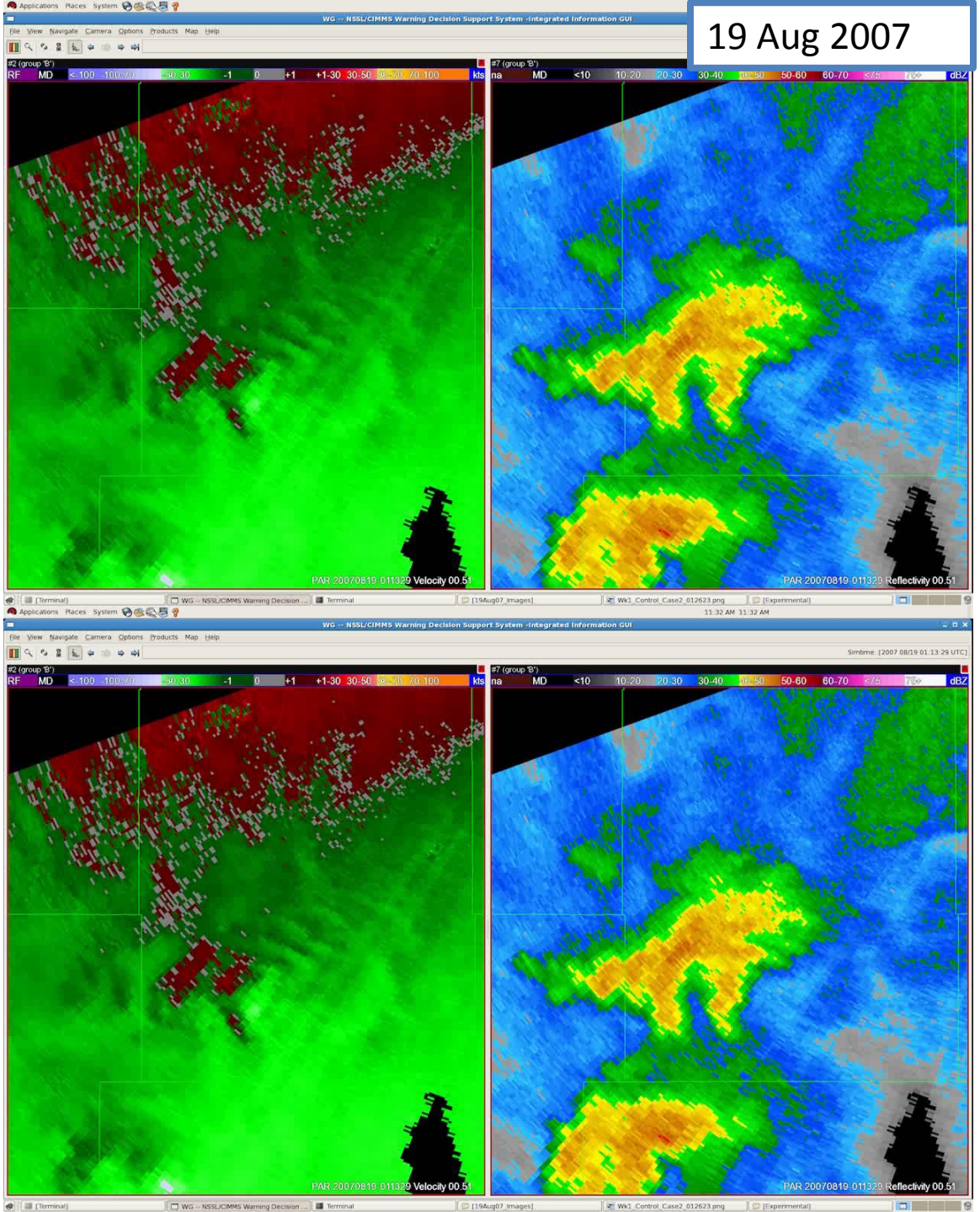
Pair 1: 43-s updates

Pair 2: 4.5-min updates

19 Aug 2007

43-s Updates

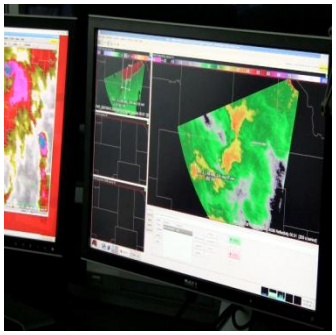
4.5-min Updates



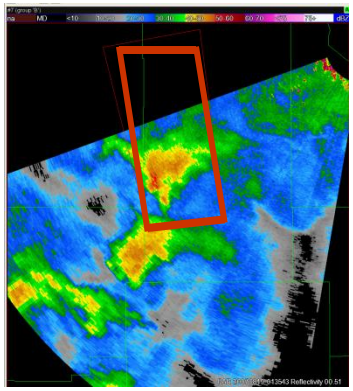
Data We Collected

What they did

Audio of the teams working through situation awareness and the case



Video of computer screens



Products issued

What we saw

Two observers took notes in each room

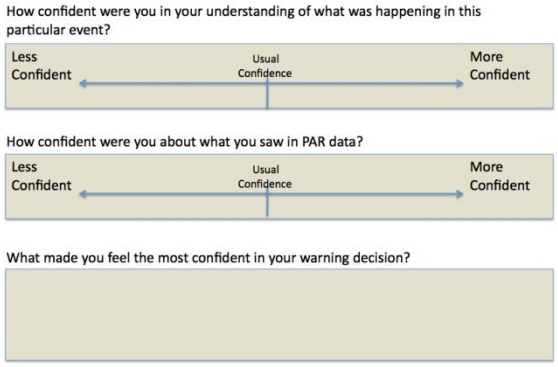
Data We Collected

What they thought they did

Teams debriefed individually

Joint debrief to compare across teams

Each individual ranked factors in their warning decision

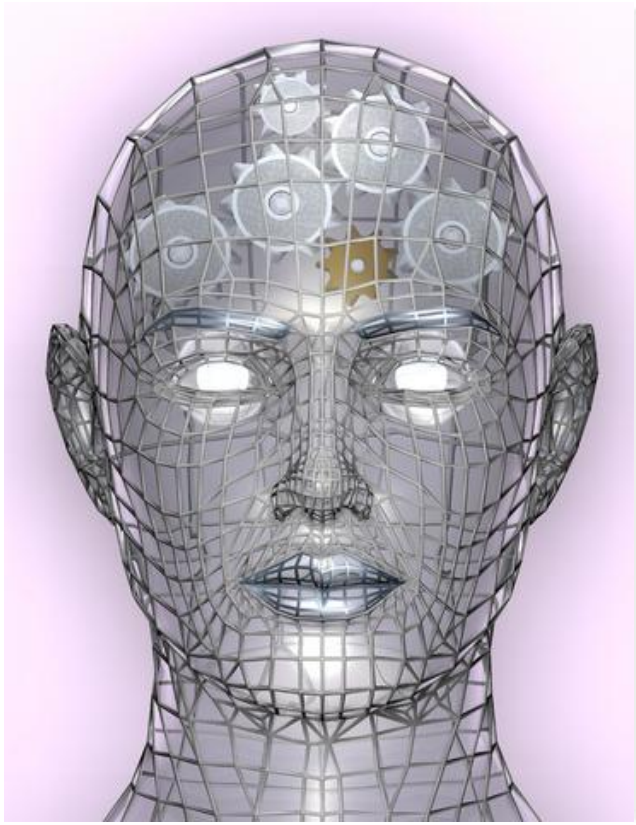


Each individual completed a confidence continuum

Understanding decision process

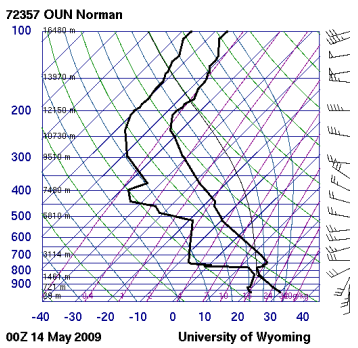
Coding and Thematic Analysis

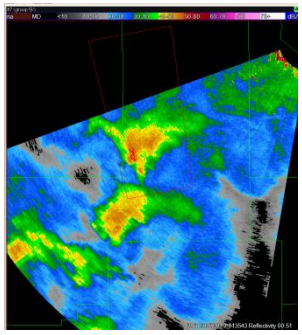
Cognitive Actions



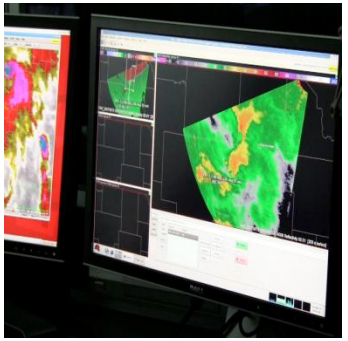
Emotions

Data used

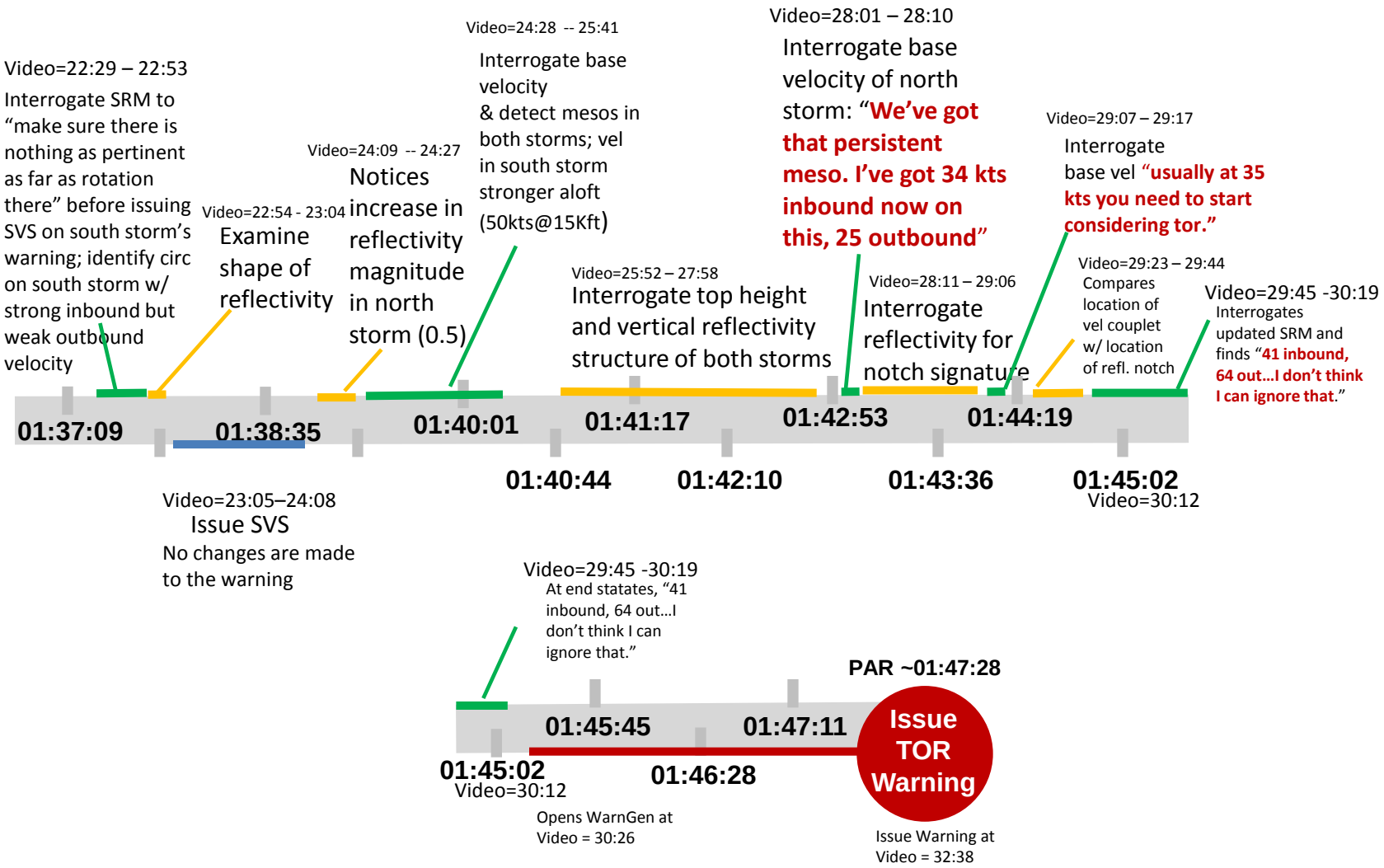


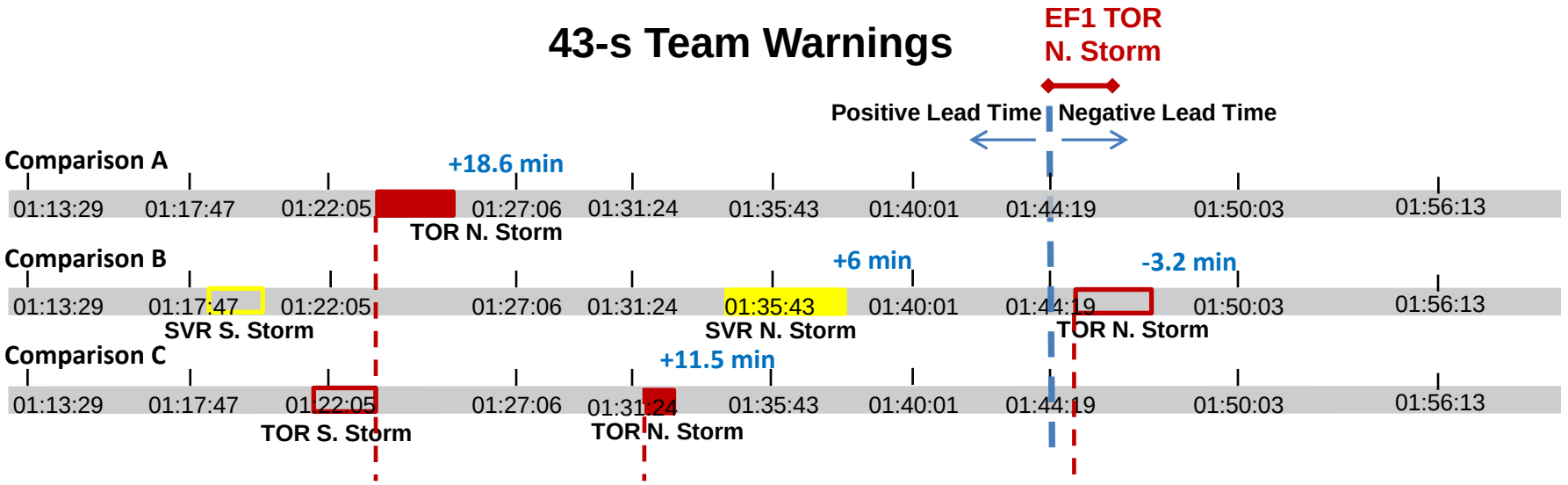


Experiment Design & Software

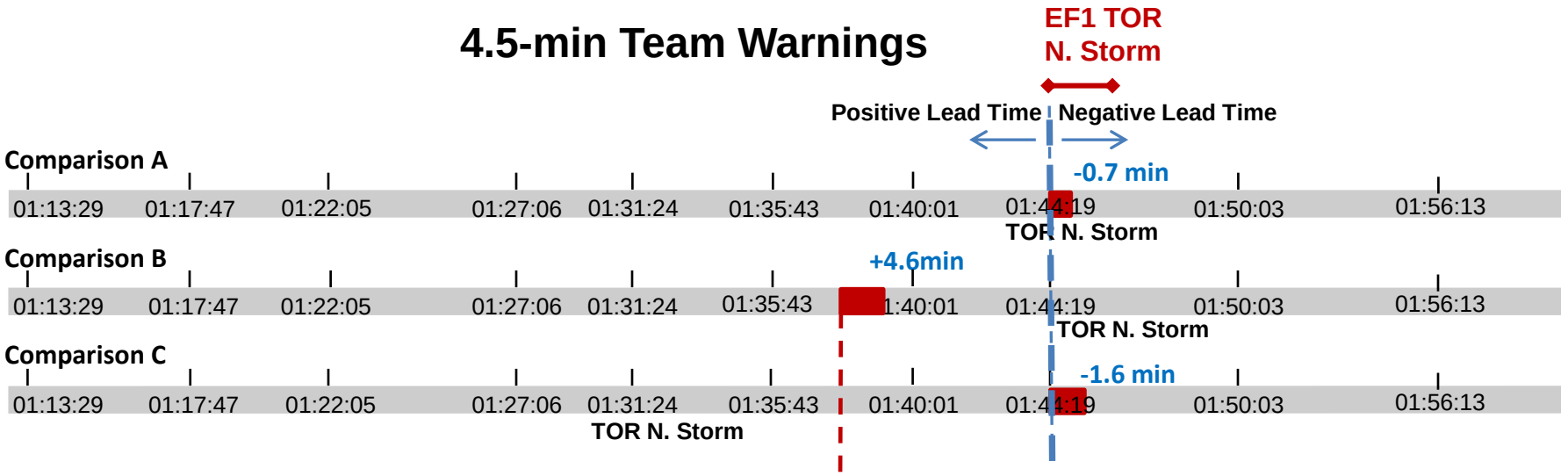


Example Analysis: 43-s Team Decision Process



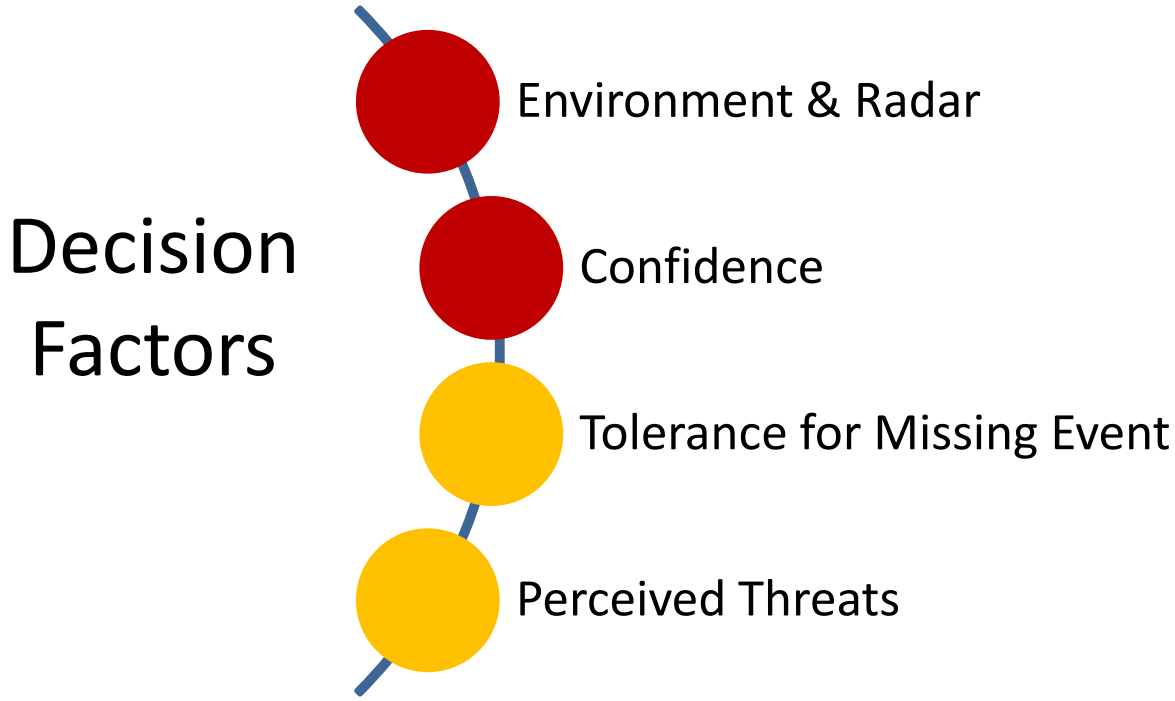

43-s Team Warnings
EF1 TOR
N. Storm
Positive Lead Time
Negative Lead Time
Comparison A
+18.6 min
01:13:29
01:17:47
01:22:05
01:27:06
01:31:24
01:35:43
01:40:01
01:44:19
01:50:03
01:56:13
TOR N. Storm
Comparison B
+6 min
-3.2 min
SVR S. Storm
SVR N. Storm
TOR N. Storm
Comparison C
+11.5 min
TOR S. Storm
TOR N. Storm

4.5-min Team Warnings



What we've learned

6 teams interrogated similar radar signatures
Came to different conclusions about whether and when to warn

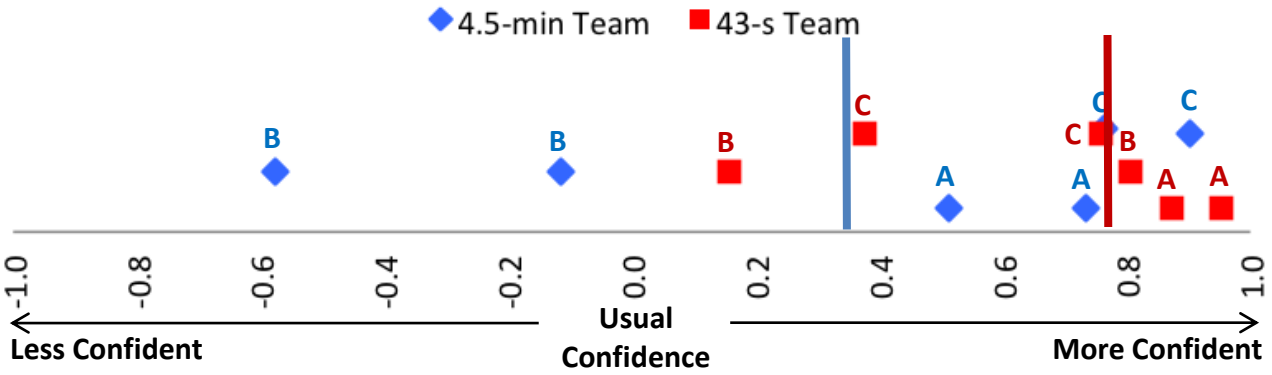


(Hahn et al. 2003; Hoffman et al. 2006; Pliske et al. 1997)

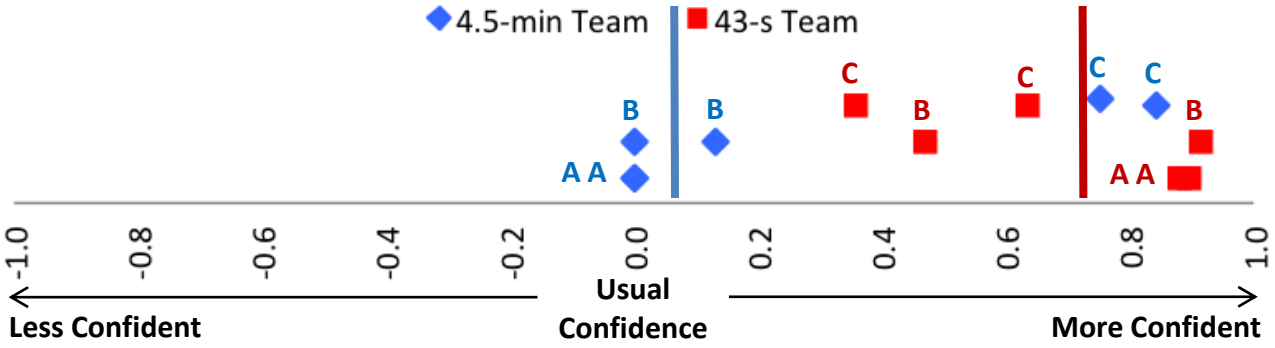
Environment & Radar Decision Factors

	43-s Team	4.5-minTeam
Weaker Couplet Strength	66%	83%
Trend in Circulation Strength	100%	100%
Update Time Detrimental	0%	100%
Environment	66%	66%
Reflectivity Notch	100%	100%

Understanding of Supercell in Tropical Environment



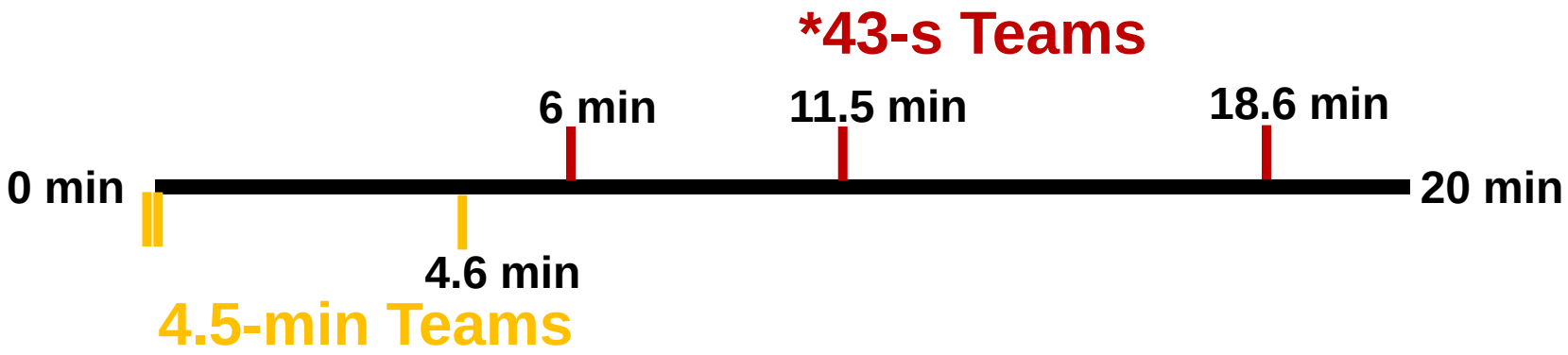
Understanding of NWRT PAR Data



What we've learned

- This type of data analysis is time intensive!
- Warning decision process is complex
- Some decision factors were similar across groups, others were not
- Update time likely had a positive impact on warning lead time

Warning Lead Times



*Issued 50% more warnings: 3 hits, 1 miss, 2 false alarms